Systemic Operational Design: Epistemological Bumpf or the Way Ahead for Operational Design?

A Monograph

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Operational design is an intellectual exercise that draws on the creative vision, experience, intuition, and judgment of commanders to provide a framework for development of detailed operation plans. Recently, a number of authors have questioned the continued relevance of the classic elements of operational design (CEOD) approach in the contemporary operating environment (COE) suggesting that we may be facing a 'crisis in operational design'.

This monograph explores this potential crisis in operational design from a Canadian Forces (CF) perspective and examines the CF CEOD methodology with a particular focus on theoretical underpinnings. Subsequently, this paper examines an Israeli Defense Force (IDF) operational design methodology, Systemic Operational Design (SOD), and compares it to the CF CEOD methodology to determine whether it might offer useful insights for practitioners of operational design in the COE. This monograph concludes that SOD is based on theoretical underpinnings that more accurately reflect the COE and a clearer and more functional conception of operational design. Finally, this monograph recommends that the CF explore SOD with a view to adopting an operational design methodology better suited to the COE.

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Systemic Operational Design: Epistemological Bumpf or the Way Ahead for Operational Design?

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Abstract

SYSTEMIC OPERATIONAL DESIGN: EPISTOMOLOGICAL BUMPF OR A GUIDEPOST FOR CONTEMPORARY OPERATIONAL DESIGN?, LCol L.C. Dalton, Canadian Army, 56 Pages

Operational design is an intellectual exercise that draws on the creative vision, experience, intuition, and judgment of commanders to provide a framework for development of detailed operation plans. Recently, a number of authors have questioned the continued relevance of the classic elements of operational design (CEOD) approach in the contemporary operating environment (COE) suggesting that we may be facing a 'crisis in operational design'.

This monograph explores this potential crisis in operational design from a Canadian Forces (CF) perspective and examines the CF CEOD methodology with a particular focus on theoretical underpinnings. Subsequently, this paper examines an Israeli Defense Force (IDF) operational design methodology, Systemic Operational Design (SOD), and compares it to the CF CEOD methodology to determine whether it might offer useful insights for practitioners of operational design in the COE. This monograph concludes that SOD is based on theoretical underpinnings that more accurately reflect the COE and a clearer and more functional conception of operational design. Finally, this monograph recommends that the CF explore SOD with a view to adopting an operational design methodology better suited to the COE.

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CHAPTER 1: INTRODUCTION

*"However, it is the **operational architect** who provides the **referential logical frame**, which gives sense to the tactical warfighters interpretive adaptation and decisive action. Therefore, operators, who are invited by national command authorities to rationalize **a singular strategic context**, and to apply this logic through a unique conception of operational maneuver, are required, very much like architects, to design new or relevant formative frames, and thus, synchronize the tension between standing formative patterns and **emerging ecologies**. Unless they are aware of this **cognitive logic**, and unless they are equipped with a thinking practice based on a method, facilitating the design of such architectural frames **(meta-concepts)**, they are doomed to be trapped in a simplistic structuralist approach."*[1]

INTRODUCTION

What is a referential logic frame, a singular strategic context, an emerging ecology, or a meta-concept? Is it the language of science fiction? No, it is not. It is the language of Systemic Operational Design (SOD), an emerging Israeli Defense Force (IDF) approach to operational design, an approach worthy of examination and consideration by the Canadian Forces (CF).

SOD is an operational design methodology based on the fundamentals of systems theory and complexity theory. SOD emerged and evolved in response to inherent challenges in the contemporary Israeli security environment, challenges similar to those confronted by the CF in the contemporary operating environment (COE)[2]. SOD was deliberately developed to address shortfalls in the IDF's approach to operational art and operational design. These shortfalls were manifested in a variety of symptoms including; the inability to effectively link tactical actions to strategic objectives, frequent operational failures, and the growing irrelevance of prevailing operational design doctrine[3]. In response to this crisis in operational design, the IDF developed a unique design methodology – SOD.

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[1] Dr BG (Reserve) Shimon Naveh, Asymmetric Conflict: "An Operational Reflection on Hegemonic Strategies" 40-41

[2] The nature of the COE will be discussed in chapter 4.

[3] Lecture by Brigadier General (Reserve) Shimon Naveh at the School of Advanced Military Studies 10 January 2006

A CRISIS IN OPERATIONAL DESIGN?

"The current interpretation of campaign design is, therefore, largely based on a juxtaposition of land-centric Clausewitzian and Jominian concepts. While used individually, these have inherent conceptual and interpretive weaknesses that can be compounded when employed in concert. A better way must be found…"[4]

A review of contemporary literature indicates that the CF might also be in the midst of a crisis in operational design. In "Campaign Design for Winning the War…and the Peace", Lieutenant-Colonel Pierre Lessard argues that the classic elements of operational design (CEOD) methodology[5] is unsuitable for application in the COE[6]. Questioning the continued relevance of doctrinally accepted concepts, such as end state and center of gravity, Lessard argues that current doctrine hinders the operational design process[7]. Similarly, in Operational Art for the Objective Force, Colonel James Greer contends that the CEOD approach is of questionable utility. Citing the complex nature of full spectrum operations and the complex challenges confronted by contemporary practitioners of operational design, Greer suggests that we must find new operational design methodologies[8]. Canadian Forces operational level doctrine also notes the fact that the CEOD methodology is difficult to apply to complex security problems in the COE[9]. Nevertheless, in spite of these acknowledged shortfalls, the CF retains the CEOD methodology as the doctrinally accepted operational design process[10].

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[4] Pierre Lessard. "Campaign Design for Winning the War …and the Peace." in *Parameters* Vol. XXXV, No 2. 36.

[5] The CEOD methodology is the classical approach to operational design based on concepts such as center of gravity, decisive points and lines of operation. For a more complete description of the CEOD approach see the CF Combined and Joint Staff Officer's Handbook.

[6] Pierre Lessard. "Campaign Design for Winning the War …and the Peace." *Parameters* Vol. XXXV, No 2. 37. For a discussion of the CEOD see the Canadian Forces College Combined and Joint Staff Officer's Handbook Part II

[7] Ibid.

[8] James K. Greer. "Operational Art for the Objective Force." in *Military Review*, 82 September/October 2002, 26-27. As defined in FM 3.0, Full spectrum operations include offensive, defensive, stability, and support operations.

[9] Canadian Force College Combined and Joint Staff Officer's Handbook, Annex B Chapter 1 Part II

[10] Canadian Forces College Combined and Joint Staff Officer's Handbook, II-1-4/16

THE PROBLEM

"21st century operations are outpacing the CEOD methodology[11]"

Dr J.J. Schneider

The CEOD approach is an ineffective operational design methodology. It is a mechanistic, linear approach to operational design based on theoretical underpinnings that are no longer relevant in the COE.

RESEARCH QUESTION

This monograph addresses a twofold research question: Why does the CEOD methodology appear to be ill suited for application in the CEOD and does SOD offer a better alternative for operational design in the COE?

RESEARCH METHODOLOGY

In order to address the research question, this monograph will facilitate a comparison between the current Canadian approach to operational design, the CEOD, and Systemic Operational Design. The comparison will focus on three aspects of each approach: the design process, the design product and the relative theoretical underpinnings. This monograph contains five chapters as follows:

Chapter 1 – Chapter 1 introduces the problem and presents key definitions and concepts.

Chapter 2 – Chapter 2 examines the current CF approach to operational design. Chapter 2 begins with an introduction of the theoretical roots of the CEOD approach and then examines the contemporary Canadian approach from both a process and product perspective.

[11] Lecture delivered by Dr. J.J. Schneider at the School of Advanced Military Studies, 20 February 2006

Chapter 3 – Chapter 3 examines the COE to identify what makes it unique from the perspective of operational design and to consider why the CEOD approach appears ill suited for application in today's complex security environment.

Chapter 4 – Chapter 4 introduces Systemic Operational Design. It begins with a discussion of SOD's theoretical underpinnings and examines why and how it emerged. Finally, Chapter 4 examines SOD as both a process and a product.

Chapter 5 – Chapter 5 compares the CF CEOD-based approach to SOD.

Chapter 6 – Chapter 6 summarizes findings and makes recommendations.

KEY DEFINITIONS AND CONCEPTS

Before proceeding with a comparison of the CEOD approach to SOD, it is first necessary to define a number of key terms and concepts that are central to this discussion. It is appropriate to acknowledge that this discussion is somewhat hindered by a lack of clarity and consensus with respect to these key terms and concepts, particularly operational design – the focus of this paper[12]. Nevertheless, the definitions below frame subsequent discussion and enable comparison of the CEOD approach to SOD. Particular nuances germane to either the CEOD approach and/or SOD are discussed in subsequent chapters.

Theory. Theory is critical to this examination of the CEOD approach and SOD because theory underpins and informs doctrine. Thus, doctrine is only as effective as its theoretical base is valid. In simple terms, theory acts like a lens to shape one's views of the world and one's views of reality. Theory, expressed as a conceptual view of the nature of warfare plays a key role in shaping doctrinal concepts. Accordingly, theory will play a prominent role in this examination of the CEOD approach and SOD and will be a key factor in assessing the utility of both approaches.

[12] Canadian Forces College Combined and Joint Staff Officer's Handbook, p. II-1-1/16

Operational Art. Art is the expression or application of creative skill or imagination[13]. In simple terms, operational art is defined as the skillful employment of tactical means to attain strategic ends. Practitioners of operational art must resolve the inherent tension between strategic aims and tactical realities through the design, planning and conduct of operations. Thus, operational art is an overarching framework within which one executes operational design and operational planning.

Operational Design. Operational design is the focus of this monograph and therefore the most important concept to define and understand. Unfortunately, it is also the concept least clearly defined and least understood. The purpose of design is "to communicate the look and function of something before it is built or made"[14]. Operational design is defined as "an intellectual exercise that draws on the creative vision, experience, intuition, and judgment of commanders"[15] to produce a conceptual framework that enables planning in complex situations. Design is required in situations characterized by complexity, ambiguity and uncertainty; in short, complexity demands design[16]. Below we discuss the two particular operational design methodologies examined in this paper.

The CF Approach – Classic Elements of Operational Design (CEOD). According to CF doctrine, operational design is both a process and a product. Terms and concepts such as center of gravity, lines of operation, decisive points, depth, simultaneity, culmination and operational reach are representative of the CEOD approach. Chapter 2 discusses the current CF operational design methodology in greater detail.

Systemic Operational Design. Systemic Operational Design (SOD) is an operational design methodology based on the application of systems theory and complexity theory to

[13] *The Concise Oxford Dictionary* (Oxford University Press: Oxford, 1999)
[14] Ibid.
[15] Issue Paper #5 (Operational Art and Design) v10, 2
[16] Lecture by Shimon Naveh at the School of Advanced Military Studies 15 January 2006.

complex problem solving. The IDF specifically designed SOD for application in the contemporary Israeli security environment. Chapter 4 discusses SOD in greater detail.

Planning. Planning is a process of making detailed preparations to achieve a particular end[17]. Planning is a linear, mechanistic process that emerged in its current form in the mid-twentieth century to increase efficiency and productivity in business and government. Chapter 2 further discusses the nature of planning.

In addition to the above definitions of individual terms, it is also important to establish how these various concepts relate to one another and, more importantly, it is important to understand the relationship between operational art, operational design and operational planning. For the purposes of this paper, it is assumed that operational art is an overarching construct that incorporates both the design and planning sub processes. Thus, design and planning enable the practice of operational art.

CHAPTER 2: CANADIAN OPERATIONAL DESIGN

INTRODUCTION

This chapter examines operational design from a Canadian perspective. The intent of this chapter is to: identify the theoretical underpinnings of CF operational design; to identify how CF doctrine conceives of operational design; and to examine the CF operational design as both a process and a product in order to enable subsequent comparison to SOD. Finally, this chapter concludes with general observations regarding the CF approach to operational design.

THEORETICAL UNDERPINNINGS

INTRODUCTION

[17] *The Concise Oxford Dictionary* (Oxford University Press: Oxford, 1999)

The current CF concept of operational design emerged out of necessity to meet a particular need; namely, the need to solve complex military problems of a unique nature. It did not emerge in its current form by chance but rather, by design. Current CF conceptions of operational art share American doctrinal and theoretical roots. One can trace these roots, or theoretical underpinnings, through the works of U.S. doctrine writers in the 1980s to Soviet military theorists of the interwar period and, based on the latter's efforts to their conceptual origins in the works of Clausewitz and Jomini. The intent of this section is to expose and briefly these theoretical underpinnings in order to facilitate a more informed examination of the CF approach to operational design (the CEOD approach) and to better enable its comparison to SOD. In particular, this section examines two theoretical pillars of contemporary operational design: the evolution of operational art and corresponding theories of warfare and the emergence of planning.

THE EVOLUTION OF OPERATIONAL ART

To examine the first pillar, we consider the works of G.S. Isserson, a Soviet military theorist whose work proved instrumental in the recognition of the operational level of warfare and the development of operational art. In his work Isserson examined the evolution of warfare from the time of Napoleon to the end of the Russian Civil War in an effort to solve the contemporary challenges posed by large-scale, state on state, mechanized warfare and to address weaknesses with contemporary military theory. In the course of his analysis, Isserson sought to uncover and understand the evolution of military theory and in the process developed an instructive framework that describes the increasingly complex nature of warfare over this 200-year period. He divided this period into epochs to demonstrate how the temporal and spatial complexities of warfare evolved in response to changing material, social and political conditions. A brief examination of Isserson's work provides valuable insights into the roots of present-day operational design. Key highlights from his work are briefly discussed below.

The "epoch of the strategy of a single point" [18]. Isserson began his study with an analysis of the Napoleonic era and concluded that warfare during this period was a "one act tactical phenomenon"[19] that took place mainly at the tactical level. Isserson named this period the "epoch of the strategy of a single point" to convey the fact that warfare took place at a single point in space and a single moment in time – there was no spatial dimension and no temporal dimension[20]. Accordingly, there was no operational level of warfare nor a need to practice operational art or design. Interestingly, it is from this period of spatially and temporally limited warfare – warfare of limited complexity – that we inherent much of the language and framework of modern operational design.

The "epoch of destruction by fire"[21] and the "epoch of linear strategy"[22]. Isserson subsequently turned to a study of warfare during the second half of the nineteenth century and identified two closely related epochs: the "epoch of destruction by fire"[23] and the "epoch of linear strategy[24]". The significant material and manpower changes introduced by the forces of industrial capitalism and universal service ushered in these two epochs. As a result of larger armies equipped with rifles, rifled field guns, the railroad and the telegraph, warfare underwent a significant temporal and spatial expansion. According to Isserson, this epoch witnessed the emergence of the operation and the operational level of war although, not the practice of operational art.

The "epoch of Imperialism"[25]. The final epoch studied by Isserson was the "epoch of imperialism" – the First World War. Isserson described the First World War as a cruel

[18] Georgii Samoilovich Isserson, *The Evolution of Operational Art* (Translated by Bruce W. Menning. The State Military Publishing House of the USSR People's Defense Commissariat: Moscow, 1937) 10

[19] Ibid. 11

[20] Ibid. 13

[21] Ibid. 13

[22] Ibid. 14

[23] Ibid. 13

[24] Ibid. 14

[25] Ibid. 23

manifestation of devastating firepower and million-man armies employed by battlefield commanders seeking the decisive battle of the Napoleonic era through broad flanking maneuvers characteristic of the "epoch of linear strategy" [26]. Warfare during this period became more temporally and spatially complex confirming Isserson's hypotheses that a new level of warfare had come to exist between the traditional strategic and tactical spheres. According to Isserson, the horrors of the First World War reflected a failure to recognize and adapt to this new paradigm. Isserson's study of this final epoch resulted in the articulation of a new paradigm, the strategic-operational-tactical paradigm, a paradigm that informed subsequent Soviet and ultimately Western operational art and operational design throughout the Cold War – "epoch of deep strategy" – and into the early 21st century. His work also resulted in the recognition of operational art as a discipline to bridge the tension between the traditional strategic and tactical levels of warfare.

IMPLICATIONS FOR CONTEMPORARY OPERATIONAL DESIGN

Isserson's work provides a number of valuable insights into the theoretical underpinnings of contemporary operational design. Firstly, it provides insights into both the conditions and the impetus behind the emergence of today's accepted strategic-operational-tactical paradigm and the associated concepts of operational art and operational design. In short, the current paradigm and, the present-day conceptions of operational art and operational designed, emerged as a result of efforts to understand and confront the increasingly complex challenges of large-scale, state on state, mechanized warfare. Secondly, Isserson's work demonstrates that current theoretical underpinnings have undergone little evolution since the interwar period and the emergence of large-scale, state on state, mechanized warfare as the dominant form of warfare. Finally, Isserson's contention that the "epoch of the strategy of the single point" was an era of limited

[26] Ibid. 19

temporal and spatial complexity suggests that the current framework and language of operational design – center of gravity, decisive points, and lines of operation – emerged as a theoretical construct to describe the nature of warfare in an epoch that bears little resemblance to the conditions manifest in the COE[27].

Isserson's work also raises a number of questions relevant to this consideration of modern-day CF operational design. Firstly, considering the evolutionary nature of warfare, as demonstrated by Isserson, why do we cling to a paradigm of large-scale, state on state, mechanized warfare? Secondly, as demonstrated by Isserson, present-day conceptions of operational art and operational design are largely based on the nature of warfare as it evolved through the "epoch of imperialism". Much has changed since Isserson's day. How many epochs might we have experienced in the latter half of the 20th century and now in the early 21st century and how might these epochs have changed the nature of warfare and therefore, our conceptions of operational art and operational design? These questions should be borne in mind when one considers CF operational design doctrine. However, before examining CF doctrine, one must consider the other theoretical pillar of Canadian operational design: planning.

THE EMERGENCE OF PLANNING

> *"The paradigm that dominates contemporary Western thought is best described as the Newtonian worldview – a view that revolves around absolute mechanics enabling precise measurement of specifics[28]"*
>
> Anton Kuruc

The Newtonian worldview remains one of the theoretical underpinnings of contemporary operational design. This is evident not only in the language of operational design – decisive points, center of gravity, lines of operational etc. – but also in the process that enables design: planning. Planning has Newtonian roots and is reductionist in nature reflecting the belief that

[27] This issue will be dealt with in Chapter 3.

[28] Anton Kuroc, The Relevance of Chaos Theory to Operations in the *Australian Defence Force Journal* No. 162 September/October 2003, 4

linear, detailed analysis leads to synthesis, accurate prediction and the ability to impose control[29]. Unfortunately, complex problems in the contemporary era often defy Newtonian linearity and therefore challenge the fundamental assumptions behind traditional planning[30].

Planning emerged during the industrial revolution, a period dominated by the Newtonian worldview[31]. Planning subsequently gained increasing popularity and application in business and government during the mid-twentieth century as a means to impose control over complicated processes and thereby improve efficiency[32]. Presently planning is employed by military organizations to similar ends; namely, to impose ones will on an adversary and instill a sense of order in chaotic or complex situations[33]. Because Canadian operational design takes place within the planning process, critical theoretical assumptions that underpin the formal planning process; namely, linear formalized process, predetermination and synthesis through analysis influence its form and practice[34].

CONCLUSION

Present-day operational design emerged out of efforts to solve a particular military problem; namely, how to overcome the challenges initially manifested during the "epoch of imperialism" – large-scale, state on state, mechanized warfare. The language and framework of today's operational design – decisive points, center of gravity and lines of operation – are based on the concepts that emerged to describe the nature of warfare during the "epoch of the strategy of a single point" an epoch of limited complexity. Finally, the theory of planning, a linear,

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[29] Mintzberg, The Rise and Fall of Strategic Planning: Reconceiving, Roles for Planning, Plans, Planners, 221-224

[30] Ervin Laszlo, *The Systems View of the World: A Holistic Vision for Our Time* (Hampton Press Inc.:Cresskill NJ, 2002) viii

[31] Donald A. Schon, *Educating the Reflective Practitioner* (Jossey-Bass: San Francisco, 1987) 3. Schon describes the traditional scientific approach to problem solving based on the Positivist philosophy.

[32] Mintzberg The Rise and Fall of Strategic Planning: Reconceiving, Roles for Planning, Plans, Planners, 222

[33] Kuruc The Relevance of Chaos Theory to Operations in the *Australian Defence Force Journal*, 5

[34] *Canadian Forces Operations*, 35 Canadian operational design takes place within the OPP process.

mechanistic, reductionist approach to problem solving, forms the basis of contemporary operational design. Collectively, these are the roots of Canadian contemporary operational design. We will now turn to an examination of Canadian operational design based on current doctrine.

CF DOCTRINE

DEFINITIONS

Before examining the current Canadian doctrinal approach to operational design, it is first necessary to examine Canadian definitions of key terms and concepts associated with operational art and operational design.

Operational Art. The skill of employing military forces to attain strategic objectives in a theatre of war or theatre of operations through the design, organization and conduct of campaigns and major operations[35].

Operational Design. Canadian doctrine uses the phrase campaign design in place of operational design. For the purposes of this paper, operational design and campaign design are interchangeable concepts. To avoid confusion we use operational design throughout. Operational design is both a process and a product as follows:

Operational design as a process. "The development of a model, based on defined tools that provides a clear conceptual depiction of how a campaign plan will lead to attainment of a specific end state, and thus achieve assigned national or strategic goals"[36]. According to Canadian doctrine, operational design takes place within the OPP process[37].

Operational design as a product. "The model that is produced by this process"[38]

[35] Canadian Forces Operations, GL-E-5
[36] Canadian Forces College Combined and Joint Staff Officer's Handbook, II-1-2/16
[37] Canadian Forces Operations, 35
[38] Ibid. II-1-2/16

Operational Planning. Operational planning is "the process whereby joint force commanders translate national or alliance military strategy into operational concepts through the development of campaign plans"[39]. The OPP process is the Canadian doctrinal planning process designed for application at the operational level and for complex problem solving. The OPP process is a typical military decision making model that is linear in nature and focused on detailed analysis. Figure 1 below graphically depicts the relationship between operational art, operational design and operational planning.

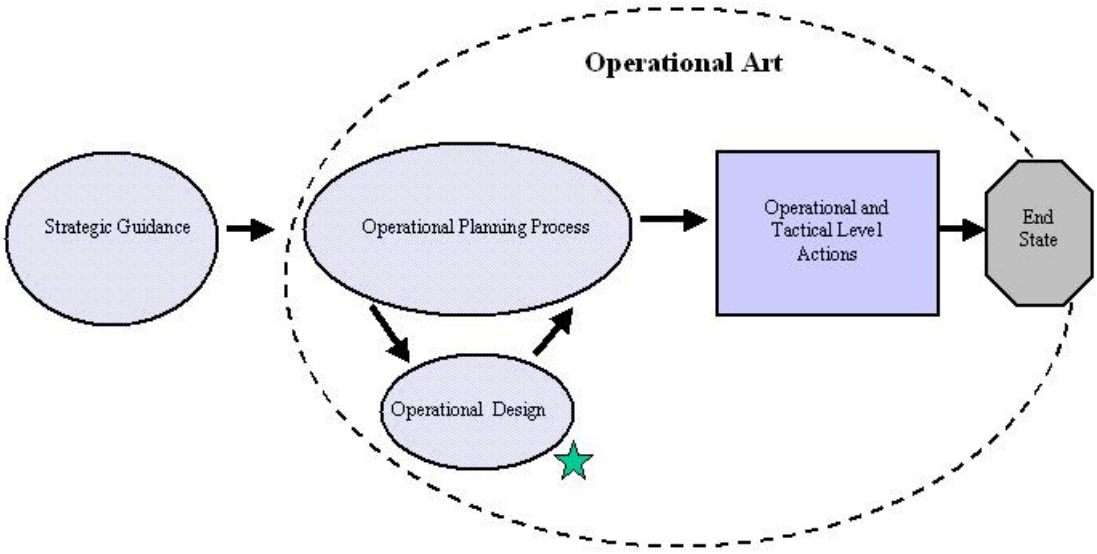

Figure 1

[39] Ibid. II-1-2/16

THE INTERRELATIONSHIP BETWEEN ART DESIGN AND PLANNING

"One problem today in studying the operational art today is a lack of consensus about the meaning of the term "operational. Despite the superficial consensus about its meaning found in Western publications, and its having achieved buzzword status within the U.S. Army and among joint communities, a good deal of confusion still surrounds the connotation and the significance of the word "operational"[40].

Canadian doctrine is not immune to this confusion. Indeed, the doctrinal relationship between operational art and operational design is muddled and reflects an overall lack of clarity and understanding. For example, Joint Doctrine Manual B-GJ-005-500/FP-00 – The Canadian Forces Operational Planning Process manual states that operational design is a sub-component of operational art – "Operational Art is defined as "The skilful employment of military forces to attain strategic and/or operational objectives through the design, organization, integration and conduct of theatre strategies, campaigns, major operations and battles"[41]. According to this definition, operational design is an enabler of operational art. Subsequently, the Canadian Forces Operational Planning Process manual suggests that to execute operational design, a commander must apply operational art – "The campaign commander therefore employs operational art in designing, commanding and conducting a campaign" [42]. In this latter case, operational art is an enabler of operational design. The CF is not alone in this lack of clarity surrounding the concepts of operational art and operational design[43]. Unfortunately, this lack of conceptual clarity is also apparent in the doctrinal relationship between operational design and operational planning.

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[40] Allen English, The Operational Art in *The Operational Art: Canadian Perspectives Context and Concepts*, (Edited by Allen English, Daniel Gosselin, Howard Coombs and Laurence M. Hickey. Canadian Defence Academy Press: Kingston, 2005) 7

[41] Canadian Forces Operational Planning, 2-2

[42] Ibid. 2-2

[43] Colonel James Simms Keeping the Operational Art Relevant for Canada: A Functional Approach in *The Operational Art: Canadian Perspectives Context and Concepts* (Edited by Allen English, Daniel Gosselin, Howard Coombs and Laurence M. Hickey. Canadian Defence Academy Press: Kingston, 2005) 296

Canadian doctrine defines operational design as both a process and a product[44]. Operational design as a product is a straightforward concept and one that is relatively easy to grasp. It is simply a graphical depiction of the commander's vision using a set of conceptual tools or graphics and a particular language: the CEOD. However, the assertion that operational design is a process is more difficult to grasp based on a review of current Canadian doctrine. Rather, examination of CF doctrine suggests that operational design and operational planning are symbiotic in nature and that operational design is a byproduct of the OPP process. What is clear is that the relationship between art and design and design and planning is somewhat unclear according to current Canadian doctrine.

OPERATIONAL DESIGN AS A PROCESS

"Key elements of the campaign design are initially developed during Stage 2 of the OPP, Mission Analysis. The campaign design is further developed during Stage 3, COA Development"

CFC Combined and Joint Forces Staff Officer's Handbook

As indicated above, operational design takes place within the OPP process. The OPP process is a typical mechanistic military decision-making process that is linear in nature and focused on analysis[45]. It results in the production of plans and orders to guide the execution of operations focused on a particular end state. The OPP process consists of the five following stages: initiation; orientation; course of action development; plan development; and plan review. Each stage in turn consists of a number of steps that further guide execution of the planning process. Figure 2 below indicates where in the OPP process design takes place and where design products emerge. To get a better sense for how these design products emerge we will now examine the appropriate OPP stages in more detail.

[44] Canadian Forces College Combined and Joint Staff Officer's Handbook, II-1-2/16

[45] *Canadian Forces Operational Planning*, 3-1 The Canadian OPP process is based on the standard NATO planning model.

Campaign Design in Relation to OPP Stages

Orientation	Mission Analysis	COA Development	Plan Development
Strategic Directive Provides: End State Objectives Strategic CG			
Campaign Design Products	Refined End State Operational CG Some Decisive Points	Additional Decisive Points Lines of Operation Sequencing	
OPP Staff Products	Mission Analysis Brief Commander's Planning Guidance	Decision Brief CONOPS	CONPLAN or OPLAN

Figure 2

OPERATIONAL DESIGN WITHIN THE OPP PROCESS

STAGE 1 – INITIATION

The initiation stage in the OPP process begins with receipt of the strategic directive and commences with the commander's estimate of the situation. During this stage, the commander is responsible for discussing the strategic directive with the strategic sponsor and for framing his initial direction to his staff based on his initial understanding of the problem.

STAGE 2 – ORIENTATION

From an operational design perspective, the orientation stage is the most important stage in the OPP process. It is during the orientation stage that the majority of the operational design work takes place and the initial operational design itself is developed. Finally, it is at the completion of the orientation stage that the commander's planning guidance articulates the operational design to planners and subordinate elements.

In terms of methodology, each subordinate step in the orientation stage produces elements of operational design. However, most of the actual operational design emerges during the mission analysis process. According to Canadian doctrine, the commander's planning guidance articulates the initial operational design, one of the key outputs of mission analysis [46]. Mission analysis takes place in the following sequence.

Review Situation. The aim of this step is to develop the boundaries of the problem, a critical component of operational design – one must understand the problem before attempting to solve it. There is no prescribed doctrinal method for doing so. Doctrinal references simply note the requirement to consider environmental, political, geographic, administrative, and command and control issues as well as the enemy and friendly situation.

Review Strategic Level. The name of this step is somewhat misleading. The aim of this step is actually to examine a number of operational design factors, taking into account but not simply reviewing the strategic level. It is during this step that the bulk of the operational design work is completed and design products produced. Note that according to doctrine, the commander is responsible for designating a number of the items below[47]. In particular, this step addresses the following issues (those emboldened are included in the commander's planning guidance under the heading of operational design). How to identify and define each of the following elements is not clearly established:

Critical Facts and Assumptions;

Constraints/Restraints;

Key Strengths and Weaknesses (Friendly and Enemy);

Center of Gravity (Friendly and Enemy) – commander's responsibility;

Tasks;

Objectives – commander's responsibility;

[46] Canadian Forces College Combined and Joint Staff Officer's Handbook, II-2-21/2

End State - commander's responsibility;

Criteria for Success – commander's responsibility;

Force Capabilities and Groupings;

Command and Control Structure;

Risk Assessment; and

Proposed Timeline

Once again, it is difficult to determine the exact methodology applied to work through this step of the orientation stage. Apart from a suggested method of analysis to determine end state and centers of gravity and describing the overall process as one of analysis, there is little doctrinal guidance available to commanders and staffs beyond the linear sequence of the mission analysis process itself[48]. In short, what elements of operational design are necessary is clear. What is not, is the methodology behind their production.

Develop Mission Statement/Prepare Mission Analysis Brief/Develop and Issue Commander's Planning Guidance. The last of these final three steps in the Orientation stage is also critical from an operational design perspective. The operational design product, in its initial form, emerges as a component of the commander's planning guidance. More specifically, a section entitled "operational design" addresses the following issues:

Initial Key Factors and Deductions;

Key Strengths and Weaknesses (enemy and friendly);

Centers of Gravity (enemy and friendly);

Decisive Points and Lines of Operation (initial cut);

Objectives (own level);

End State; and

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[47] Canadian Forces Operational Planning Process, 4-5

Criteria for Success.

Each of the above mentioned elements of operational design have particular meaning for both planning staffs and subordinate formations. The design elements guide detailed planning and enable subordinate formations to commence parallel planning in accordance with an overall design. These elements of operational design will be further discussed below but first, the last OPP stage with a role in operational design, COA development, will be examined.

STAGE 3 – COA DEVELOPMENT

COA development is an important step from an operational design perspective. It represents a refinement of the initial operational design produced during mission analysis. It allows for more detailed analysis of particular courses of action and in the process generates better-defined or refined decisive points and lines of operation. In addition, it permits greater clarity in terms of sequencing and deception, two items doctrinally identified as elements of operational design. In summary, according to Canadian doctrine, the COA development stage completes the operational design process and enables the expression of operational design as a final product. We will now turn to an examination of the operational design product.

OPERATIONAL DESIGN AS A PRODUCT

According to CF doctrine, the operational design product is a model that represents the commander's vision in a graphical and conceptual manner. The model expresses the operational design using a common language, the CEOD, to describe how the commander envisions accomplishing the strategic end state. Its purpose is to provide guidance to planning staffs and subordinate elements so that planning can begin. According to CF doctrine, the following terms are the key elements of operational design:

[48] The CF OPP Manual does not provide any procedural guidance. However, the CF Joint and Combined Staff Officer's Handbook does offer a suggested methodology for determining and the end state and center of gravity.

End State. The desired political and/or military situation at the completion of operations[49]. "Determining the military end state, and ensuring that it accomplishes the strategic objectives, are the *critical first steps* in the conceptual design of the campaign. Failure to make this determination will waste scarce resources and put the entire effort at risk"[50].

Objectives. "Clearly defined, decisive and attainable goals towards which all operations are directed (not just military action is directed)"[51].

Criteria for Success**.** Criteria for success are developed based on the stated strategic end state and serve the purpose of identifying those military conditions that must be met in order to achieve the strategic end state. According to doctrine, establishing criteria for success also assists in ensuring that an operation's design is in line with the aims of the strategic sponsor[52].

Center of Gravity. The COG is that characteristic, capability, or locality from which a military force, nation or alliance derives its freedom of action, physical strength, or will to fight[53]. "The center of gravity is that aspect of the enemy's total capability, which if attacked and eliminated or neutralized, will lead either to his inevitable defeat or his wish to sue for peace through negotiations. It may also be that characteristic, capability, or location from which enemy and friendly forces derive their freedom of action, physical strength, or will to fight. "The identification of the enemy's center of gravity, and the single-minded focus on the sequence of actions necessary to expose and neutralize it are the essence of operational art"[54].

Decisive Point. Decisive points are the keys to getting at the centers of gravity. They may exist in time, space or in the information environment[55]. "Decisive points are those events, the successful outcome of which are preconditions to the defeat or neutralization of the enemy's

[49] NATO AAP-6
[50] Canadian Forces Operations, 3-2
[51] Quadripartite Combined Joint Warfare Conference 2 June 2004
[52] Canadian Forces Combined and Joint Staff Officer's Handbook, II-1-7/16
[53] Canadian Forces Operational Planning Process, G-1
[54] Canadian Forces Operations, 3-2
[55] Ibid. G-2

center of gravity" [56]. Consequently, a series of decisive points leading from the commander's base of operations to the opposing force's center of gravity will need to be identified"[57]

Lines of Operation. Lines of operations define the directional orientation of the force in time and space in relation to opposing forces. A force operates on "interior" lines when its operations diverge from a central point. A force operates on "exterior" lines when its operations converge on an enemy[58]. Lines of operation describe how to apply military force in time and space through decisive points on the path to the center of gravity. They are not synonymous with physical axes of advance. They establish the relationship between decisive points, produce a critical path to the center of gravity, and ensure that events occur in a logical progression.

Although there are other doctrinally defined elements of operational design, those listed above are the key elements included in the commander's planning guidance and therefore are of critical importance from an operational design perspective. Not only do these individual concepts have particular meanings, but their use together in a framework also has implications from an operational design perspective. For example, the combination of center of gravity, decisive points and lines of operation, expresses in simple terms, a design for achieving a particular end state. Closer examination of the Canadian language of operational design is interesting and reveals a great deal about the theoretical underpinnings of the Canadian approach.

[56] Ibid. 3-2
[57] Ibid. 3-3
[58] Ibid. G-2

CONCLUSION

"Finally, theories are an important part of the process of creating doctrine…. Theory is one of the key ingredients to developing effective doctrine".[59]

In The Operational Art: Canadian Perspectives Context and Concepts, Allen English discusses the importance of theory to doctrine. English contends that understanding the origins of a particular theory, its limits, and the biases of those who develop it are critical to determining its relevance for application in particular circumstances. Such caution appears to be wise counsel when one considers the continued relevance of the CEOD approach to operational design from both a process and a product perspective.

In terms of process, the CF operational design methodology is difficult to differentiate or separate from planning. In fact, one could argue that no distinct design process exists. From a theoretical perspective this is interesting because it suggests that design emerges as a result of planning, a teleological process that is linear, deterministic and reductionist. It also raises a more fundamental question: what is operational design from a CF perspective?

Canadian operational design is equally interesting from a product perspective. It is based on individual terms and concepts as well as the lines of operation – decisive points – center of gravity framework both of which reflect a linear, deterministic view of the world. In short, the current Canadian approach to operational design is linear, reductionist and deterministic. Perhaps this accounts for the growing dissonance between theory and practice, a growing dissonance raised by a number of theorists and practitioners of operational design as well as CF doctrine[60]. To shed light on the possible nature of this dissonance we will now examine the present epoch: the COE.

CHAPTER 3: THE CONTEMPORARY OPERATING ENVIRONMENT (COE)

"Unfortunately, the current operational-design construct is often incapable of providing planners and commanders the means of designing campaigns and major operations full-spectrum operations require. Today's doctrinal concepts for operational design hamstring planners' and commanders' abilities to design and conduct effective, coherent campaigns for operations across the spectrum of conflict in today's security environment"[61]

Colonel James K. Greer

INTRODUCTION

The intent of this chapter is to discuss the COE in order to shed light on why traditional approaches to operational design hamstring today's practitioners of operational art. In order to do so this chapter examines COE Canadian policy documents, CF doctrine and the views of present-day theorists.

CONTEMPORARY VIEWS

At present, there is ongoing debate concerning the nature of warfare. The debate concerns whether or not we are in the midst of a fundamental shift in warfare as an instrument of policy or merely an evolution of the modalities of warfare[62]. To continue with Isserson's analytical approach, have we entered a new epoch in warfare and, if so, what characteristics might define this new epoch? While the outcome of this debate may only be of academic import, the fact that this debate is taking place is instructive from an operational design perspective. It is instructive because it underscores the significance of the changes that have taken place in the

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[59] Allan English, The Operational Art in The Operational Art: Canadian Perspectives Context and Concepts, 5

[60] Canadian Forces Combined and Joint Staff Officer's Handbook, II-1-1/16

[61] James K. Greer. "Operational Art for the Objective Force." *Military Review*, 82 September/October 2002, 26-27

[62] For an overview of the debate on the changing nature of warfare see the preface to *Rethinking the Principles of War edited* by Anthony D. McIvor.

COE and leads one to question whether or not the traditional approach to operational design remains relevant.

What makes the COE so unique and complex? From Samuel Huntington's *Clash of Civilizations* to Thomas Barnett's *The Pentagon's New Map* to Robert Kaplan's *The Coming Anarchy*, academics and theorists have grappled with this question and in the process identified a number of change factors that contribute to the complexity of the post-Cold War era. Some of these characteristics include globalization, the information revolution, culture, religion, demographics, economics, non-state actors, transnational terrorist groups, and international criminal syndicates. While many, if not all, of these factors have been present in earlier epochs, what makes the COE unique is the fact that these factors directly influence the nature of the military problem and lend the COE a degree of complexity heretofore absent[63]. This uniqueness is even more apparent from an operational design perspective when one considers the theoretical underpinnings of contemporary operational design: large-scale, state on state, mechanized warfare and the theory of planning.

Canada's International Policy Statement recognizes the impact of globalization, non-state actors, rouge states and terrorist organizations and the complex nature of the threats inherent in the COE. *Securing an Open Society: Canada's National Security Policy* reinforces and elaborates upon this view. Recognizing that we live in "an increasingly interconnected, complex and dangerous world"[64], the national security policy identifies the need for engagement to counter the new and more complex threats of the 21st century. CF doctrinal publications, such as Report Number 99-2: *The Future Security Environment* and the Canadian Army's capstone doctrinal manual, *Canada's Army: We Stand on Guard for Thee*, also identify and acknowledge the importance of emerging social, cultural, religious, political, economic, demographic,

[63] Charles A Pfaff, Chaos, Complexity and the Battlefield in *Military Review*, July-August 2000 83

technological, informational and security trends. These various trends suggest that the present epoch differs greatly from those that gave rise to the CEOD approach to operational design and may explain the dissonance between the CEOD's theoretical underpinnings and its practical application in the COE.

From an operational design perspective, the *Canadian Forces College Combined and Joint Staff Officer's Handbook* also acknowledges the highly complex nature of the COE and recognizes that the CEOD methodology fails to meet the challenges posed by this complexity[65]. Author and military theorist Robert Leonhard offers an explanation for why this is the case. Leonhard argues that operational art is a product, and now a questionable relic, of the Cold War – the "epoch of deep strategy". Leonhard contends that change factors inherent in the COE have rendered the theoretical underpinnings, namely large scale mechanized warfare between nation states, irrelevant to today's security problems. From an operational design perspective, Leonhard contends that the linear, template driven operational design process (CEOD), while effective for application to Cold War problems, is no longer suitable for the joint, interagency, multinational problems facing contemporary practitioners of operational design[66]. If Leonhard is correct, then the COE demands a new approach to operational design; a design that accounts for the joint, interagency, multinational nature of 21st century conflict and one that facilitates design in a complex environment. Fortunately, there are emerging alternative operational design methodologies to address this reality. One such methodology is that of Systemic Operational Design.

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[64] Securing an Open Society: Canada's National Security Policy (Government of Canada, 2004) vii.

[65] Canadian Forces Combined and Joint Staff Officer's Handbook, Annex B Chapter 1 Part II

[66] Robert Leonhard, From Operational Art to Grand Strategy, in *Rethinking the Principles of War* (Edited by Anthony D. McIvor. U.S. Naval Institute Press: Maryland, 2005) 210-212

CHAPTER 4: SYSTEMIC OPERATIONAL DESIGN (SOD)

INTRODUCTION

The intent of this chapter is to introduce SOD as an emerging alternative design methodology by focusing on four points of discussion. First, this chapter will discuss what SOD is and why SOD emerged. Second, it will discuss the theoretical underpinnings of SOD; namely, systems theory and complexity theory. Third, several unique characteristics of SOD as an operational design methodology are introduced and discussed. Finally, this chapter examines SOD both as a process and as a product.

WHAT IS SOD AND WHY DID SOD EMERGE?

SOD is an alternative operational design methodology that attempts to rationalize complexity through systemic logic. It represents the application of systems theory and complexity theory to complex security problems. SOD views operational design as a sub component and key enabler of operational art that functions cooperatively with planning and execution through a continuous cycle of design, plan, act and learn. SOD is a commander-led discursive approach to operational design that facilitates operational planning and execution by developing and articulating a hypothetical systems framework and logic within which planning can proceed. This implies a unique view of design and its relation to planning, a view that is consistent with the complex nature of today's security environment.

The IDF adopted SOD in the year 2000 based on the work of Brigadier General (Reserve) Shimon Naveh and his colleagues at the Operational Theory Research Institute. The IDF adopted SOD in response to a crisis in operational art. Symptoms of the crisis included numerous operational failures, ineffective operational thinking, and ineffective operational

design[67]. In short, SOD emerged because the traditional Israeli approach to operational design had proven ineffective in dealing with the increasing complexity of the Israeli security environment[68]. The result was an inability to logically and purposefully bridge the gap between strategy and tactics; thus, the crisis in operational art.

Brigadier General (Reserve) Naveh and his colleagues at the Operational Theory Research Institute developed SOD after significant research into the evolution of operational art and its relation to strategy and tactics. They concluded that the traditional teleological approach to operational art based on a Western philosophy of positivism and idealism was ill suited for application in the complex Israeli security environment[69]. As a result, they turned to emerging decision-making theories based on systems and complexity theory to develop a new approach to operational art and operational design. The result was SOD. Before examining SOD as a process and as a product, we will first consider its theoretical underpinnings.

THEORETICAL UNDERPINNINGS

"A new view of the world is taking shape in the minds of advanced scientific thinkers the world over, and it offers the best hope of understanding and controlling the processes that affect the lives of us all. Let us not delay, then, in doing our best to come to a clear understanding of it.[70]"

Ervin Laszlo, The Systems View of the World: A Holistic Vision for Our Time

This new view of the world is the "systems view", based on systems theory. Systems theory offers an alternative worldview through with to consider the complex problems encountered in the COE, problems that challenge the current CEOD methodology based on Newtonian science. The CF College Combined and Joint Staff Officer's Handbook recognizes both the limitations of the Newtonian-science based CEOD approach and the potential of the

[67] Interview with Brigadier General (Reserve) Shimon Naveh at Fort Leavenworth 10 January 2006

[68] Ibid.

[69] Interview with Brigadier General (Reserve) Shimon Naveh at Fort Leavenworth 17 March 2006

systems approach as an operational design methodology[71]. We briefly examine systems and complexity theory below.

SYSTEMS THEORY

Systems theory emerged independently in a number of scientific disciplines including physics, chemistry, biology, economics and social science response to the limitations of Newtonian science[72]. In particular, the mechanistic, reductionist Newtonian approach was unable to sufficiently explain the workings of real world systems[73]. Because most of what exists in the world exists as part of a system or multiple systems, a new scientific approach emerged to compliment Newtonian science. Systems theory was the new approach.

General systems theory is based on the premise that systems, regardless of their nature, i.e., social, physical, biological, etc., share certain common characteristics and behaviors[74]. Further, general systems theory suggests that general systems properties and laws can be postulated to explain these general characteristics and behaviors of systems in order to add clarity and understanding to the behavior of systems and to individual systems components.

Systems are "sets of elements standing in interrelation"[75]. The building blocks of systems science are organizations. The currency of systems science is interaction between elements of organizations. Human organizations are open systems whose elements operate purposefully through interaction on two dimensions: internally amongst their own subsystems and externally with the environment[76]. Elements interact by exchanging energy and/or information with other systems elements. The result is a continual, non-linear evolution of individual elements and the system as a whole. Accordingly, one can only understand systems

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[70] Laszlo, The Systems View of the World: A Holistic Vision for Our Time, viii
[71] Canadian Forces Combined and Joint Staff Officer's Handbook Annex B to Chapter 1 Part II
[72] Laszlo, The Systems View of the World: A Holistic Vision for Our Time, 8
[73] Ludwig von Bertalanffy, *General Systems Theory: Foundations, Development, Applications*, (George Braziller, Inc.: New York, 1993) 12
[74] Bertanlannfy General Systems Theory: Foundations, Development, Applications, 37
[75] Ibid. 38

and their individual components, by taking a holistic perspective. In short, systems theory takes a holistic approach to understanding individual components and the larger system they comprise as opposed to Newtonian science, which seeks understanding through a mechanistic reductionist approach. More recently, a new theory, complexity theory has emerged to deal with a specific type of system, a type of system that is increasingly common in the COE: the complex adaptive system.

COMPLEXITY THEORY

Complexity theory is an emerging science that builds on the work of systems theory and chaos theory[77] to offer an alternative view of the working of complex adaptive systems such as those that exist in the COE. Like systems theory, complexity theory emerged in a number of disciplines including mathematics, physics, biology, computer science and social science. Complexity theory contends that traditional reductionism cannot explain the behavior of complex adaptive systems. Complexity theory focuses on one specific type of system; namely, the complex adaptive system.

Complex adaptive systems are open systems comprised of elements that seek growth or progress through adaptation[78]. They exhibit spontaneous self-organization, they are competitive and, they continually learn and adapt in an effort to turn situations to their advantage. They are complex because they comprise a number of independent elements that interact with each other in a non-linear manner[79]. Unlike closed systems, or complicated systems, one cannot understand complex adaptive systems by reducing them to their individual elements. Complexity theory contends that to understand the nature of a complex system, one must understand the nature of the

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[76] The Relevance of Chaos Theory to Operations in the *Australian Defence Force Journal*, 7

[77] Chaos theory is the study of non-linear systems that are sensitive to initial conditions. For further information see Anton Kuruc's *The Relevance of Chaos Theory to Operations in the Australian Defense Force Journal* NO. 162 September/October 2003.

[78] Robert Axelrod and Michael D. Cohen, Harnessing Complexity: Organizational Implications of a Scientific Frontier (Basic Books: New York, 2000) 7

many varied relationships that exists between individual system elements and how this interaction affects the overall form and logic of the system. Complexity theory is particularly relevant to this discussion of operational design and the COE for a number of reasons. First, the COE represents a marked increase in the degree of complexity confronted by practitioners of operational design[80]. Second, complexity demands design[81]. Finally, a design approach known as the Complex Adaptive System approach has emerged to guide designers in dealing with issues of complexity.

SOD – UNIQUE CHARACTERISTICS

The influence of both systems theory and complexity theory is evident throughout the SOD process and particularly in the unique SOD characteristics/principles discussed below.

Systems Thinking. Systems thinking forms the theoretical basis of SOD. Systems thinking may be defined as a holistic approach to organizing knowledge in terms of systems, systemic properties and inter-system relationships. Systems thinking considers agents, populations of agents, strategies and artifacts as the key elements of systems and the key focal points for both learning and action[82]. Systems thinking focuses on the interaction or interrelation of individual elements within a system in order to learn about and understand a system's form and logic.

Exploiting Tensions. By focusing on the interaction and interrelation of system elements SOD identifies tensions within the system. These tensions help to articulate the systems logic and the logic of individual elements within the system. In addition, tensions may present

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[79] M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (Simon and Schuster: New York, 1992) 11

[80] Major Charles A. Plaff, Chaos, Complexity and the Modern Battlefield in *Military Review* July-August 2000.

[81] Interview with Shimon Naveh at Fort Leavenworth 16 March 2006.

[82] Agents are individuals or groups of individuals that exist within a system. Strategies are applied by agents or populations of agents within systems and therefore influence the nature of systems. Artifacts are inanimate elements of a system, i.e. a constitution or a border. For a more detailed explanation of each of these system components and their interrelation see Axlerod and Cohen's *Harnessing Complexity: Organizational Implications of a Scientific Frontier* pages 4-7.

opportunities for learning or, through exploitation, opportunities for taking action that may move the system in the direction desired by the strategic logic.

Problem Framing Versus Problem Solving. SOD proceeds on the assumption that the nature of a particular problem can never be fully defined by the strategic sponsor nor can problem solving, or planning, proceed without first framing the problem. One of the key roles of the operational designer is to frame the problem by rationalizing the logic of the strategic sponsor with that of the system and the rival. Every complex problem is unique and must be set within a unique systemic frame created by the operational designer. To inform and enable planning, one must frame the problem through the practice of design.

Design Versus Planning**.** Complexity demands design[83]. In order to commence planning, operational designers must first construct a hypothetical framework that rationalizes the complexity of the system and expresses a design as form and logic. This hypothetical framework and design provides the boundaries and logic necessary to enable planning. Figure 3 highlights the difference between design and planning according to SOD.

[83] Schon, *Educating the Reflective Practitioner* 42. Schon refers to John Dewy's definition of a designer whose role is to make the indeterminate determinate in order to enable planning and execution.

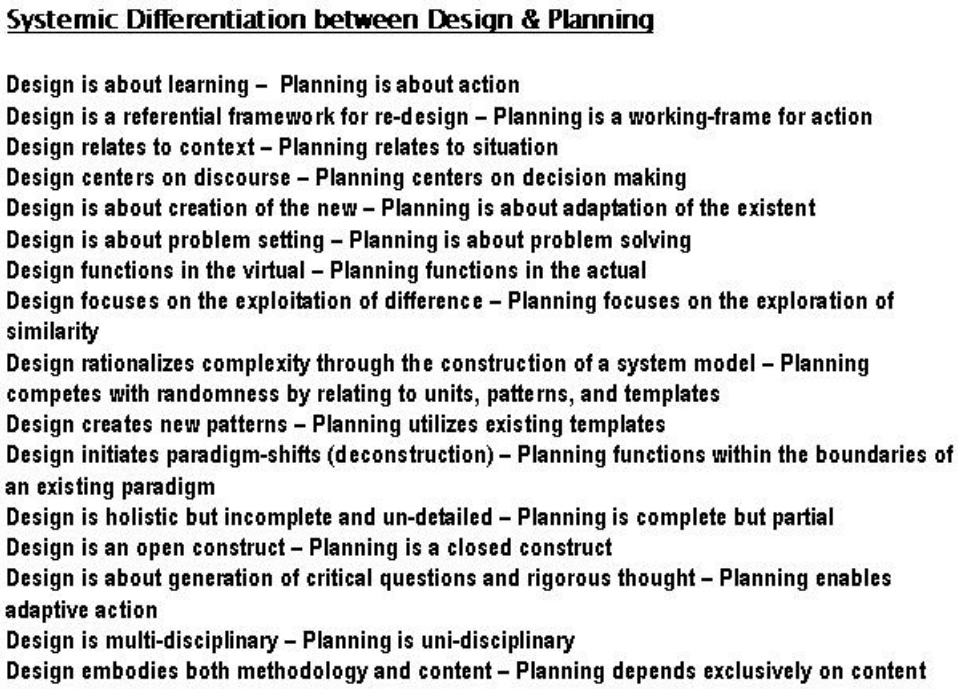

Figure 3

An Aversion to Prediction. The more complex a problem the more difficult and potentially counterproductive it is to predict systemic outcomes[84]. Accordingly, SOD eschews prediction and does not produce campaign plans in the traditional linear, temporal format nor does it produce branches or sequels.

Self-Regulation. Complex adaptive systems are in a constant state of evolution. By their nature, elements within a system survive through adaptation or self-regulation in response to injections of energy or information into the system. This self-regulation can be spontaneous and commence without direction from a central authority. As a result, SOD recognizes the need to be sensitive to and learn about self-regulation within a system. According to SOD, operational maneuver is a mechanism for learning.

[84] Axlerod and Cohen, Harnessing Complexity: Organizational Implications of a Scientific Frontier, 12.

Emergence. Emergences are the manifestations of self-regulation. They are changes in either the form or logic of the system, or both, in relation to an injection of energy or information into the system. They are difficult if not impossible to predict yet critical to the ongoing requirement to learn about the system. SOD acknowledges and considers the potential time delay associated with emergences and the difficulty in determining the cause of an emergence given the complex non-linear relationships that exist within complex adaptive systems.

Act for Effect Versus Act to Learn**.** According to SOD, operational designers must strike a balance between learning and effects-focused action because of the complex nature and intransparence of dynamic systems. This is necessary because the system frame produced by the operational designer is nothing more than a cognitive framework or hypothesis to enable planning and execution. The more complex a problem, the greater the degree of intransparence; therefore, the more the operational design must satisfy the need to learn.

In addition to the SOD characteristics directly related to systems and complexity theory, there are other general characteristics of the SOD process that differ from the CEOD approach and are therefore deserving of mention.

Role of the Commander. While the CEOD process is commander-led, the SOD process is commander-centric. In practicing SOD, the commander is both present and personally leads the operational design process and each reframing session[85].

Discourse. SOD employs egalitarian discourse, with little attention paid to rank or position, as the driving methodology behind the operational design process. Further, while SOD does not seek disagreement, it does seek understanding by exploiting the difference between the views of design participants. This reflects the belief that complex problems demand synthesis, which results only from discourse and the application of the Socratic method. SOD is also unique because design teams, not individual planners, participate in the process.

Use of Historical Examples and Metaphors. SOD relies heavily on the use of history and metaphor as a start point for discourse to explore and describe what may be unique about an emerging situation. By identifying what is new and what is not, the nature of the current problem begins to take shape and can be described using language unique to the problem at hand.

Exploration/Learning. SOD accepts the fact that the designer's framework is hypothetical and that it does not exist in reality. Rather, the designer frames the hypothetical system to facilitate problem definition, to enable initial operational design and to set the stage for subsequent learning. As a result, exploration, learning and reframing are essential to the SOD process to ensure that over time, the hypothesis moves closer to reality.

Meta Inquiry. SOD focuses not only on the problem, but also, on how to think about how to approach solving the problem. This is based on the view that each complex problem is unique and may require a unique cognitive approach to framing and design. This belief also enables design teams to adjust the SOD process to the peculiarities of a particular problem or a particular design team. Accordingly, Meta questions are an inherent part of each step in the SOD process and precede the step-specific discourse.

Iteration and Redesign. The IDF view of campaign planning acknowledges the unpredictability of intervention in complex systems and therefore designs in an iterative fashion based on a design-plan-execute-learn-design cycle. SOD does not follow the teleological backwards-planning approach to problem solving nor does it devote time to branches and sequels.

[85] Reframing is a process that reevaluates the system frame based on observed changes in the form and/or logic of system components.

IDF DOCTRINE

"Beginning with situations that are at least part uncertain, ill defined, complex and incoherent, designers construct and impose a coherence of their own. Subsequently they discover consequences and implications of their constructions which they appreciate and evaluate. Their designing is a web of projected moves and discovered consequences and implications, sometimes leading to reconstruction of the initial coherence – a reflective conversation with the materials of a situation"[86].

Donald A. Schon

Unlike the CF and most western militaries, the IDF does not place an emphasis on formal doctrine. As a result, there is little written on SOD or on particular concepts such as operational art and operational design. It is therefore somewhat difficult to determine doctrinal definitions. However, based on the SOD process, material gained through interviews and training with members of the Operational Theory Research Institute, it is possible to articulate a broad view of operational design from an IDF perspective.

The phrase, complexity demands design, expresses the IDF view of operational design. This view expresses a particular worldview based on systems and complexity theory as well as emerging insights into the limits of traditional science or positivism[87]. In a military construct, operational design functions in a characteristically complex and indeterminate space, the space between strategic and tactical cognition. The role of operational design within this space is to make the indeterminate determinate[88]. Thus, design is a process that enables the development of a hypothesis – an operational design – that bridges the strategic and tactical levels of thought and provides planners with a temporary determinate space within which to plan, execute and learn.

[86] Schon, Educating the Reflective Practitioner 42
[87] Interview with Brigadier General (Reserve) Shimon Naveh at Fort Leavenworth, 17 March 2006
[88] Schon, Educating the Reflective Practitioner 42

Finally, the hypothetical design framework serves as a base of knowledge from which a designer, or a design team, can reframe and refine the hypotheses over time.

SOD AS A PROCESS

SOD is a spiral and associative process that is comprised of seven steps of related discourse that build upon and inform one another[89]. The seven discourses lead to the articulation of a holistic operational design that enables detailed planning and execution. Each discourse has a particular aim and focuses on addressing a number of broad design questions. Questions consist of both Meta inquiry and those focused on the system itself, i.e., agents, strategies and artifacts. While the sequencing of the process follows a particular logic, i.e., broad to narrow or abstract to concrete, the steps are interrelated and flow quite naturally one into the other. Discourse in one step will often contribute insights to be captured and further discussed in subsequent steps or be used to enhance the work of prior steps. In short, it is not a linear lockstep process. Rather, it is structured brainstorming. Figure 4 displays the seven steps of SOD briefly described below.

[89] Shimon Naveh. *Dicoursive "Command - Operators - Systemic Operational Design: A New Framework for Strategic Epistemology."* Article on-line. Available at: http://home.no.net/tacops/Taktikk/Kadettarbeid/naveh.htm. Internet. Accessed 15 November 2005

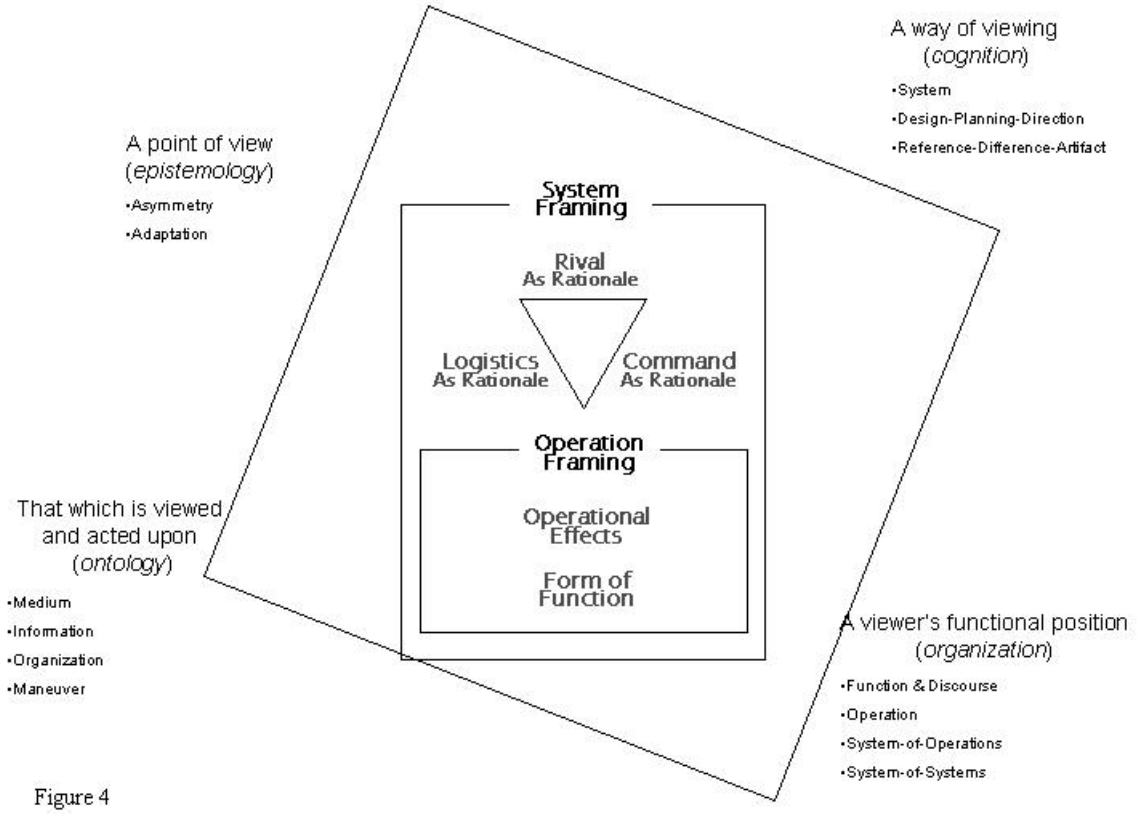

Figure 4

SYSTEMS FRAMING

The first step in SOD is systems framing. The aim of systems framing is to rationalize the strategic directive by establishing system boundaries and identifying what has changed – what is the cause for intervention? In the process, operational designers develop a hypothetical system frame for further study that includes those elements that, through their form or logic, have a bearing on the problem at hand. Subsequently, operational designers explore individual elements and their interrelationships to determine their form and logic and to identify tensions within the system. The system boundaries are arbitrary and subject to change during the initial or subsequent design sessions. During systems framing the design team should also identify obstacles to learning including potential bias and instransparencies and consider strategies to counter them. There are two products produced during the systems framing discourse. The first is a diagram that captures the hypothetical system, its components and the relationships that exist

between components. The second product is a running narrative that compliments the systems diagram and that captures key insights that emerge during the systems framing session. This narrative is a story that captures the logic of the design team and further develops during subsequent discourses.

RIVAL AS RATIONAL

The aim of the rival as rational discourse is to identify those elements of the system – actors, strategies and artifacts – that oppose the desired system trend expressed in the strategic guidance. The rival as rational discourse leads to a definition of the rival and an understanding of both the rival's form and logic. It is important to note, that in complex systems the rival may very well consist of a combination of disparate and uncoordinated elements – agents, strategies and artifacts – that together comprise an obstacle to the desired state of the system. Once identified as an element of the rival, the design team discusses each component from a cultural, economical, social, strategic, command and learning, logistical and organizational and operational maneuver perspective to better understand the form and logic of individual rival components. Finally, the design team examines the relationships between components of the rival from both an internal and external systems perspective in order to identify potential tensions and to develop a holistic rival form and logic. The outputs of the rival as rational discourse include a diagram and a narrative that capture key insights from the rival as rational discourse and clearly express the rival's form and logic.

COMMAND AS RATIONAL

The aim of the command as rational discourse is to examine the tension that exists between the current command structure and that required by the emerging design based on the system, the rival and, the logic of the strategic directive. Critical to this discourse is the ability to assess how current command structures are suited to enable action and learning within the system frame. Particularly relevant today are the demands and opportunities presented by multinational and interagency operations. The results of the command as rational discourse may lead to

internal reorganization or structural change in order to better address challenges in acting and learning within the system. The products produced during this discourse include a command and control diagram and key command and control insights for the running narrative.

LOGISTICS AS RATIONAL

The aim of the logistics as rational discourse is to examine the tension that exists between the existing logistics system and that required by the emerging design. This discourse examines the capabilities and limitations of the friendly logistics system and enables continuation of the design process with a sound understanding of what current and potential logistics systems will be able to support from a design perspective. Logistics as rationale has three sub-areas for focused examination: Strategic mobilization, strategic-operational deployability, and operational sustainment. Strategic mobilization and strategic-operational deployment are areas of meta-logistics. Strategic mobilization considers the relations between the national strategic logistical system and the system of logistics required for the operation. Strategic-operational deployability is the dimension of logistics that organizes operational time, space, and resources. Operational sustainment deals with supporting the forces on the ground. The result of logistics as a rationale is an understanding of the unique challenges presented by the operation and an identification of means by which to address them.[90] The output of this discourse forms part of the design narrative.

OPERATION FRAMING

Operation framing marks the transition from strategic logic to operational form and from problem setting to problem solving[91]. Operation framing consists of three separate yet intimately related discourses: operation framing, operational effects and forms of function. The first discourse, operation framing, rationalizes the strategic logic within the systemic context

[90] Unpublished SOD SOP developed by School of Advance Military Studies SOD design team 2006

developed through systems framing, to include the rival command and logistics as rational discourses. It expresses this rationalization as an operational form and logic set in both time and space. In addition, operational framing also identifies those broad conditions that if achieved, would enable the operational form and logic to move the system in the direction desired by the strategic sponsor. Operation framing achieves five broad objectives; namely, it articulates an end state, it establishes the spatial setting for operations, it establishes the temporal setting for operations, it sets the conditions for operational learning through maneuver and, it articulates the form of maneuver. Operational framing also provides the overarching logic for considering operational effects. The output of this discourse forms part of the design narrative.

OPERATIONAL EFFECTS

The operational effects discourse derives its logic from the operation framing discourse[92]. The purpose of the operational effects discourse is to examine the identified conditions within the established systemic logic that, if achieved, may transform the system in a positive manner in relation to the strategic directive. The operational effects discourse then considers the interrelation of the rival and friendly force within the systemic context and seeks to identify forms of maneuver that will generate effects in support of the broad conditions identified during the operation framing discourse. In addition, the operational effects discourse provides a baseline framework for understanding the interrelated elements of the rival and oneself and serves as a point of initiation for learning through military action. The operational effects discourse also adds clarity to sequencing and identifies effects and conditions that need to be coordinated and/or deconflicted between different agencies. Finally, the operational effects discourse provides the basis for detailed COA development during the forms of function discourse. The outputs of the

[91] Brigadier (Reserve) Shimon Naveh, Questions of Operational Art: The Depth Structures of SOD, December 2005, 48

[92] Ibid. 51

operational effects discourse include a diagram that details desired effects related to the operational logic and key insights incorporated into the running narrative.

FORMS OF FUNCTION

The forms of function discourse builds on the operation framing and the operational effects discourse and provides fidelity to the operational design. It is during the forms of function discourse that the transition to detailed planning occurs and planners become engaged in the SOD process. The result is a translation of operational logic in the forms of conditions and effects into task and purpose in the form of a directed COA. This directed COA will serve as the basic design for detailed planning. The key product produced during this discourse is the operational design. It takes the form of a narrative and a graphic.

SOD AS A PRODUCT

SOD as a process produces four products. The first product is a running narrative that captures the key insights that emerge from each of the seven discourses. There is no particular format; however, the intent is to tell a story as it develops through the individual discourses capturing the logic of the design team. In addition to the narrative, the design team produces three graphic products. The first graphic product is the system frame. This product depicts the system, its individual components' form and logic, and their interrelationship. The second graphic product is the rival as rational graphic. This graphic, initially based on the systems frame graphic, focuses specifically on those agents, strategies and artifacts that comprise the rival. The final graphic product is the forms of function graphic, which depicts the directed COA. The planning staff receives all four products in hard copy accompanied by a design briefing/discussion.

CONCLUSION

SOD is a unique operational design methodology based on systems and complexity theory that aims to rationalize complexity through systemic logic. It emerged in response to a crisis in operational art and replaced the traditional reductionist operational design methodology previously employed by the IDF. SOD as a process consists of seven individual yet related discourses each with specific objectives from an operational design perspective. General questions guide, but do not restrict each discourse based on the understanding that unique problems and individual design teams call for inherent flexibility and space for creativity. In short, SOD is structured brainstorming that strives to bridge the strategic and tactical spheres of thought by making the indeterminate determinate.

In terms of a product, the SOD process results in the production of a narrative, a graphical depiction of the systems frame, a graphical depiction of the rival as rational and a graphical depiction of forms and function (directed COA). The design team will brief these four products, which comprise an operational hypothesis, to the planning staff during the transition to planning.

CHAPTER 5: A COMPARISON OF CEOD TO SOD

INTRODUCTION

The intent of this chapter is to compare the CEOD approach to SOD to understand how they differ, how they are similar and to consider which approach is more suitable for application in the COE. In doing so, one must acknowledge the limitations of such a comparison based on the nature of the two design methodologies. In fact comparing the CEOD approach to SOD is somewhat like comparing apples to oranges because, although they are both operational design methodologies and share some similarity of purpose, they also represent very different conceptions of operational design and its purpose. Further, one must also consider the fact that

there is no doctrinally established set of criteria by which to assess the effectiveness of an operational design methodology. Accordingly, this paper proposes and considers the following criteria to enable comparison of the CEOD approach to SOD:

Conceptual Clarity. Does the operational design methodology make sense? Is its role and purpose clearly understood? Does it clearly relate to operational art and operational design?

Theoretical Underpinnings. What theory informs the operational design methodology? Does the theory accurately reflect the reality of the COE?

Utility for Designers. Does the operational design methodology have a clearly defined and easily understood process? Does it support the practice of operational art – bridge the gap between strategy and tactics?

Utility for Planners. How well does the operational design methodology enable the transition to planning? How useful is the operational design product from the perspective of a planner?

CONCEPTUAL CLARITY

As mentioned in Chapter 1, operational design is an ill-defined concept that suffers from a lack of conceptual clarity. This is currently the case with CF doctrine. The *Canadian Forces Combined and Joint Staff Officer's Handbook* defines operational design as a process and a product that provides "a clear depiction of how a campaign plan will lead to attainment of a specific end state" [93]. It also states that operational design takes place within the OPP process. Therefore, one could argue that operational design is not a process at all; but rather, it is a byproduct of planning undertaken with a clear understanding of the commander's vision. Additional doctrinal references support this contention suggesting that the commander's vision is

[93] Canadian Forces Combined and Joint Staff Officer's Handbook, II-1-2/16

the "essence of the design"[94] which itself, represents "the heart of the joint plan"[95]. Considering this product-focused definition of operational design and the fact that operational design is a byproduct of the OPP process, one could conclude that operational design is simply a graphical depiction of a concept of operations based on the commander's vision and detailed staff work realized through a traditional linear, mechanistic planning process[96].

By contrast, SOD is a much clearer and better-defined concept than the CF CEOD methodology. SOD takes a fundamentally different view of design and conceives its role to be one of enabling operational art, hence the suggestion that comparing the CF CEOD approach to SOD is really one of apples to oranges. According to SOD the aim of operational design is to make the indeterminate determinate by establishing an enabling hypothetical framework for action. This does not imply that SOD strives to be predictive; but rather, that SOD recognizes that the complex and indeterminate nature of the COE inhibits coherent action and the simple application of templated solutions based on immutable strategic guidance. SOD reflects the belief that complexity demands design and that operational art exists in a complex realm. Thus, the role of design is to establish a working hypothesis to bridge the strategic and tactical spheres of thought to enable detailed planning, execution and learning to take place in a complex indeterminate environment. While the CEOD approach sees operational design as the "heart of the joint plan" [97], SOD considers operational design to be the cognitive engine of operational art.

In terms of conceptual clarity SOD has a distinct advantage over the CF CEOD methodology. SOD clearly defines design and planning, it clearly defines their relationship and it clearly defines their respective objectives within the overarching operational art construct. SOD

[94] Canadian Forces Operations 36

[95] Ibid. II-1-3/16

[96] The *Canadian Forces Combined and Joint Staff Officer's Handbook* come closest to articulating the purpose of design. It states on page II-1-3/16: "It clarifies the end state to be achieved, identifies how the adversary's strengths will be countered and his vulnerabilities exploited, and defines in broad terms the part that subordinate components will play in supporting the joint campaign". The CF Operations manual also states on page 36 that the commander's vision is the essence of design.

has two particular functions. Firstly, it defines the problem by establishing a system frame and a corresponding logic. Secondly, it produces an operational design that rationalizes the strategic objectives within the context of the system frame. In short, SOD is more mature and more clearly defined as a process. By contrast, the CEOD approach to operational design lacks conceptual clarity. The definitions for operational art and operational design are confusing and not easily grasped. The relationship between operational art, operational design and operational planning is likewise confusing or in the very least, ill defined.

THEORETICAL UNDERPINNINGS

Theory informs and underpins doctrine. Thus, unsound or incomplete theory may result in doctrine that is of limited or no utility. Considering the CEOD methodology and SOD from the perspective of theory offers useful insights into their relevance and potential utility in the COE. As discussed in Chapter 2, two particular theories underpin the CEOD methodology: the theory of large-scale, state on state, mechanized warfare and the theory of planning.

The first theory, that of large-scale, state on state, mechanized warfare defines the nature of the military problem to be solved or the framework within which operational design was envisioned to function. The large-scale, state on state, mechanized warfare paradigm has dominated operational design from end of the "epoch of imperialism" throughout the "epoch of deep strategy" and continues to form the theoretical basis of contemporary CF operational design.

The second theory, that of planning, currently underpins the CF OPP process, the process by which operational design takes place. The theory of planning, a linear, reductionist and mechanistic process, emerged during the industrial revolution as a tool to enable the imposition of control on complex situations or problems. While the practical limits of this Newtonian worldview are now recognized, the influence of this theory remains evident in the OPP process

[97] Ibid. II-1-3/16

and in the language and framework of CF operational design[98]. To describe the CEOD process based on its theoretical underpinnings one could conclude that the CEOD methodology is a mechanistic, analytic approach to problem solving that seeks to control or impose order on complicated situations characterized by large-scale, state on state mechanized warfare.

By contrast, SOD reflects fundamentally different theoretical underpinnings. First, SOD emerged to confront challenges posed by a different theoretical paradigm of warfare, that of irregular vice large scale, state on state mechanized warfare. Second, this paradigm was characterized by the tenets of systems and complexity theory. According to these theoretical underpinnings, SOD is a design methodology that seeks to harness complexity through application of systems logic.

Finally, SOD is based on a theory of design that is fundamentally different than that associated with the CEOD methodology. More specifically, SOD incorporates the view that complexity demands design. Design in this sense refers to a creative, cognitive process that aims to create a hypothetical framework to enable action in an indeterminate situation. Based on these theoretical underpinnings, one could describe SOD as a cognitive design process based on systems and complexity theory that seeks to generate, test and modify operational hypotheses to enable planning and execution in complex warfare situations. In this regard, SOD appears to be based on theoretical underpinnings that are more conducive to the practice of operational design in the COE.

UTILITY FOR DESIGNERS

This comparison criterion focuses on the clarity and the utility of the two operational design methodologies from the perspective of a practitioner of operational design. As stated under the conceptual clarity heading above, the CEOD methodology is difficult to identify and

[98] Schon, Educating the Reflective Practitioner 4

articulate as a distinct process while SOD follows a clear yet flexible process that can be modified to suit particular problems and the unique make-up of individual design teams.

In terms of process, the CEOD methodology is somewhat difficult to describe. Canadian doctrine suggests that there is no specific process that, if followed, will result in the perfect plan. However, this view appears to have led to a situation where there is no process for operational design. Rather, operational design takes place within the OPP process. Further, the products of operational design emerge out of various steps of the OPP process as indicated at Figure 2. Accordingly, despite its characterization as a process, it is difficult to discern and articulate a CF operational design process based on current doctrine.

Based on the rather elusive nature of the CEOD design process, it is difficult to determine its utility as a process. However, the fact that the concept and the process are difficult to define and identify could lead one to conclude that they are of limited utility to a practitioner of operational design in their present form. This contention appears to be borne out by anecdotal evidence. Numerous authors, several of which have already been cited in this paper, have expressed frustration with the current CEOD methodology. This frustration in applying the CEOD approach is also acknowledged in CF doctrine. Finally, this frustration has also been expressed during interviews with both commanders and planners based on recent operational experience in the COE[99].

By contrast, SOD is a clearly defined design process based on seven separate discourses all related and contributing to the final design product. Each of the seven discourses has a particular aim and focuses on guiding questions. Further, each of the seven discourses focuses on the production of a clearly defined product. In addition to the clearly defined nature of the SOD process, SOD also incorporates several unique procedural aspects that enhance its effectiveness.

[99] Author interviews with Brigadier-General S.A. Beare, former Commander Multinational Brigade Southwest (SFOR) and Lieutenant-Colonel Howard Coombs, former planner during ISAF V. Both

The two most significant are the involvement of the commander and subordinate commanders and, the use of discourse as a heuristic tool. The involvement of the commander and subordinate commanders significantly enhances the collective orientation of the command element and ensures that commanders, designers and planners all proceed from a common basis of understanding. The use of discourse takes advantage of opposing views and exploits difference in opinions to enhance understanding and achieve synthesis.

An additional benefit of SOD is its use of history to reveal patterns of form and logic for use in complex problem solving. This does not imply that if x happened once and y resulted that if x occurs again y will once again result. Rather, the fact that situation x led to result y is merely used as a reference point for discourse and the exploration of similarities and differences. This approach facilitates discourse, a richer understanding of the problem and helps to form an operational logic.

Finally, another advantage of the SOD process worthy of mention is the single directed COA that emerges at the completion of the forms of function discourse. This is worthy of note and consideration for two particular reasons. Firstly, because of the commander's involvement throughout the design process and the way the SOD process intrinsically and logically generates options for action during the operation framing and operational effects discourses, the single COA emerges as a natural byproduct of the process. Further, the narrative reflects the logic of the directed COA based on the results of the seven individual discourses. Secondly, in light of emerging science concerning human decision-making in complex, indeterminate situations, SOD as a process, follows natural intuitive problem solving patterns as opposed to the CEOD

BGen Beare and LCol Coombs were involved in operational design and both expressed the need to adopt alternative methods based on the unsuitability of the CEOD approach in complex problem situations.

methodology which follows the traditional analytic multi-COA approach to design and problem solving[100].

The suggested limited utility of the CEOD methodology in the COE should not be surprising. Given the theoretical underpinnings of the CEOD methodology and the highly complex joint, interagency, multinational nature of the COE one would expect to encounter a degree of dissonance. In short, a linear, mechanistic design methodology focused on the production of a deterministic center of gravity-decisive points-line of operational framework designed for application in large-scale, state on state, mechanized warfare is of limited utility in the complex, indeterminate COE.

By contrast, the SOD methodology was designed for application in the contemporary Israeli security environment, an indeterminate environment of considerable complexity. It is also based on a conception of design that enables the application of systemic logic to complex problems: its theoretical underpinnings enhance its utility for operational designers.
In terms of process, SOD is also clearly articulated and relatively easy to understand and apply. While the language of SOD is somewhat esoteric, once understood, it is a simple, flexible and productive framework that allows operational designers to generate a hypothetical systems framework in order to facilitate planning and execution. SOD also benefits designers by creating a much richer understanding of the problem and its surrounding context which facilitates informed discourse with the strategic sponsor.

UTILITY FOR PLANNERS

The intent of this criterion is to compare and consider the utility of the two operational design methodologies, the CEOD methodology and SOD, from the perspective of a planner. The first consideration is the quality and utility of the design products. To review, the design products

[100] William Duggan, *Coup d'Oeil: Strategic Intuition in Army Planning*, (Strategic Studies Institute 2005) v

produced by the CEOD methodology include a graphic accompanied by a written design paragraph as part of the commander's planning guidance. The design products produced by the SOD process included a narrative that captures the logic of the design team through each of the seven SOD discourses and a graphical depiction of each of the systems frame, the rival as rational and the operational design in the form of a directed COA.

There is a significant difference between SOD and the CF CEOD methodology from a product perspective. The difference is one of language, format and content. In terms of language, the CEOD methodology employs a very familiar and well-understood language. However, it is a language that emerged to describe the conduct of warfare in the "epoch of the strategy of a single point", an era characterized by linear and deterministic thinking. This language, based on the CEOD, conveys a predictive, deterministic finality in the design concept as discussed in Chapter 2. By contrast, SOD employs an unfamiliar and at times esoteric language based on a vocabulary of epistemology as well as systems and complexity theory. While this initially causes confusion and uncertainty, over time its coherence and relevance to the nature of the problems encountered in the COE renders it intuitive and very useful to convey a design and to inform planners.

In terms of format, both the CEOD methodology and SOD produce written as well as graphical design products with one key difference. The CEOD methodology written design product emerges in a paragraph in the commander's planning guidance document and potentially in formal written orders. The SOD written design product is a more detailed and thorough product that emerges in the form of a narrative to tell the story of the seven SOD discourses. This product captures key insights from each of the seven discourses as well as the logic of the design team and the overall design. This product is useful for informing planners and serves as a sound basis from which to conduct reframing and operational learning in subsequent operational frames.

Both the CEOD methodology and SOD also produce graphic design products to accompany the written design products. The CEOD product is a graphical depiction of the

operational design. SOD produces three products, which are much more informative for a planner and include: a systems frame; a rival as rational frame; and an the operational design sketch. These SOD graphical products accompany the narrative and together serve to better situate a planner than the CEOD products. For example, as a planner examines the rival as rational graphic, which depicts system agents, strategies, artifacts, and relationships that comprise the rival, he/she can consult the narrative, which explains the logic behind the production of graphic.

A comparison of the CEOD and SOD generated products reveals that the SOD products are much more complete and more adequately capture the essence of the operational design process. This results in a better-informed planning staff and better facilitates reframing and operational learning during execution.

CONCLUSION

The CEOD methodology and SOD differ significantly in terms of their inherent conception of design, their theoretical underpinnings and in terms of process and product. While the Canadian conception of operational design views design as the "heart of the joint plan", it nevertheless emerges as a byproduct of a linear planning process. SOD, on the other hand, views design as a distinct process that is critical for dealing with complex problem solving. Further, SOD sees operational design as a precursor to planning.

In terms of theoretical underpinnings, the CEOD process reflects the collective efforts of military thinkers who confronted problems of large state on state mechanized warfare. SOD was designed by thinkers who applied systems and complexity theory to the complex challenges of the COE.

Finally, in terms of process and product, the SOD methodology is more clearly defined, robust and flows in a much more logical manner. Unlike the CEOD methodology, it is not intermixed with the planning process but stands alone and proceeds along very logical lines to the articulation of a design. This robustness and thoroughness of process is also reflected in the SOD

products, which are far more complete and useful from the perspective of a planner than those produced through application of the CEOD methodology. In short, SOD is a superior operational design methodology from the perspective of theoretical underpinnings, process and product.

CHAPTER 6: CONCLUSION

SUMMARY

The intent of this paper was to facilitate a comparison between the CEOD methodology and SOD in order to determine why the CEOD approach seems ill suited for application in the COE and to determine whether SOD is worthy of consideration as an alternative operational design methodology. Below is a brief summary of key findings.

Currently there exists a degree of dissatisfaction with the CF CEOD process and with traditional operational design methodologies in general. Various authors, practitioners of operational design and CF doctrine have expressed this dissatisfaction in a variety of forums and in the process have highlighted a growing dissonance between the theoretical underpinnings of the CEOD methodology and its application in the COE. This suggests that we may be facing a 'theoretical crisis' in operational design. This dissonance is attributable to the fact that the theoretical underpinnings of the CEOD approach are of questionable validity and relevance in the COE rendering the CEOD approach to be of limited utility from both a process and a product perspective. The theoretical underpinnings of the CF CEOD methodology are as follows:

1. A paradigm of large-scale, state on state mechanized warfare characterized by the "epoch of deep strategy".
2. A linear, mechanistic, reductionist framework and language of operational design that dates to the "epoch of the strategy of the singly point", an era characterized by Newtonian science.
3. A theory of planning that reflects a linear, mechanistic Newtonian worldview.

In short, while the CEOD methodology may have been suitable for application during the "epoch of deep strategy" it is not suitable for application in the CEO; hence the 'theoretical crisis' in operational design.

The IDF recently confronted a similar crisis in operational design and in the process developed SOD. SOD is a unique operational design methodology based on systems and complexity theory that aims to rationalize complexity through systemic logic. It emerged in response to a crisis in operational art and replaced the traditional reductionist operational design methodology previously employed by the IDF. SOD is a conceptually clear design process that sees operational design as a cognitive engine that enables operational art. While one must be cautious and acknowledge that SOD emerged in response to the unique security challenges faced by the IDF, its theoretical underpinnings and conception of design, nevertheless better reflect the realities of the COE. In short, SOD offers a useful alternative to the CEOD methodology and is worthy of further consideration.

RECOMMENDATIONS

1. The CF should examine and, modify as necessary, its doctrinal definitions of operational art, operational design and operational planning in order to clarify individual concepts and their relationship to one another.
2. The CF should examine its current operational design methodology to determine whether or not its theoretical underpinnings remain relevant to the COE and to 21st century conflict.
3. The CF should examine emerging insights into the nature of design and its potential for enabling planning and action in indeterminate, complex problem situations.
4. The CF should examine systems and complexity theory to determine their potential utility as conceptual or theoretical guides to the design, planning and conduct of operations in

the COE. The CF should incorporate these theories into the professional military education system at the appropriate levels.

5. The CF should further examine the potential utility of SOD as an operational design methodology to augment or replace the CEOD approach. In particular, the CF should examine the theoretical and philosophical underpinnings of the SOD approach to determine SOD's potential applicability within both a Canadian political and operational context.

BIBLIOGRAPHY

Books

Alberts, David S. and Tom Czerwinski (eds), *Complexity, Global Politics, and National Security*.Washington D.C.: National Defense University 1997.

Alberts, David S., and Richard E. Hayes. *Power to the Edge*. Washington, D.C.: Command and Control Research Program, 2003.

Arquilla, John, and David Ronfeldt. *Swarming and the Future of Conflict*. Santa Monica, CA: Rand, 2000

Bertalanffy, Ludwig von. *General Systems Theory – Foundations, Development, Applications*. Eleventh Printing. New York: George Braziller 1993.

Czerwinski, Thomas J. *Coping with the Bounds – Speculations On Nonlinearity in Military Affairs*. Institute for National Strategic Studies, Washington D.C.: 1998.

Dorner, Dietrich. *The Logic of Failure – Realizing and Avoiding Failure in Complex Situations*. Translated by Rita and Robert Kimber 1996. Cambridge, Massachusetts: 1989.

Gleick, James. *Chaos – Making a New Science*. New York: Penguin Books, 1997.

Isserson, Georgii Samoilovich. *The Evolution of Operational Art* translated by Bruce W. Menning. The State Military Publishing House of the USSR People's Defense Commissariat: Moscow, 1937.

Klein, Gary. Sources of Power: *How People Make Decisions*. Cambridge, MA: MIT Press, 1999.

Lalzlo, Ervin. *The Systems View of the World: A Holistic Vision for Our Time*. 4th Printing. Cresskill, New Jersey: Hampton Press, 1996.

Moffat, James. *Complexity Theory and Network Centric Warfare*. DoD Command and Control Research Program. Library of Congress, 2003.

Naveh, Shimon. *In Pursuit of Military Excellence: The Evolution of Operational Theory*. London: Frank Cass, 1997.

Neustadt, Richard E. and Ernest R. May. *Thinking in Time: The Uses of History for Decision Makers*. New York: The Free Press, 1986.

Orenstein, Harold S. *The Evolution of Soviet Operational Art. 1927-1991: The Documentary Basis, Vol 1, Operational Art 1967-1964.* London: Frank Cass, 1995.

Potts, David (ed). *The Big Issue: Command and Combat in the Information Age* (A View from Upavon). Washington, D.C.: Command and Control Research Program, 2003.

Prins, Gwyn, *The Heart of War - On Power, Conflict and Obligation in the Twenty-First Century*. London, 2002.

Reynolds, Paul. A., *A Primer in Theory Construction*. Boston: Allyn and Bacon, 1971.

Schon, Donald A., *The Reflective Practitioner – How Professionals Think in Action*. New York, 1983.

Schon, Donald A., *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass, 1987.

Senge, Peter M. *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York. Doubleday, 1994.

Smith, Edward A., *Effects Based Operations: Applying Network Centric Warfare in Peace, Crisis and War*. Washington, D.C.: Command and Control Research Program, 1992.

Svechin, Aleksandr A. *Strategy*. 3d Printing. Minneapolis, Minnesota: East View Publications, 1999.

Turabian, Kate L. *A Manual for Writers of Term Papers, Theses, and Dissertations*. 6th ed. Chicago: University of Chicago Press, 1996.

Waldrop, M. Mitchell. *Complexity: The Emergence Science at the Edge of Chaos*. New York. Touchstone Books, 1992.

Canadian Forces Combined and Joint Staff Officer's Handbook

Canadian Forces Operations

The Concise Oxford Dictionary. Oxford University Press: Oxford, 1999

Periodicals, Journals and Articles

Issue Paper #5 (Operational Art and Design) v10.

Duggan, William. *Coup d'Oeil: Strategic Intuition in Army Planning*, Strategic Studies Institute, 2005.

Greer, James K. "Operational Art for the Objective Force." *Military Review*, 82 September/October 2002.

Kuroc, Anton. The Relevance of Chaos Theory to Operations in the *Australian Defence Force Journal* No. 162 September/October 2003

Leonhard, Robert. From Operational Art to Grand Strategy, in *Rethinking the Principles of War* (Edited by Anthony D. McIvor. U.S. Naval Institute Press: Maryland, 2005)

Lessard, Pierre. "Campaign Design for Winning the War …and the Peace." P*arameters* Vol.XXXV, No 2.

Meigs, Montgomery C. "Operational Art in the New Century." *Parameters*, Spring 2001, Vol.31, Issue 1.

Naveh, Shimon. Questions of Operational Art: The Depth Structures of SOD, December 2005

Naveh, Shimon. Dicoursive "Command - Operators - Systemic Operational Design: A New Framework for Strategic Epistemology."

Naveh, Shimon. Asymmetric Conflict: "An Operational Reflection on Hegemonic Strategies"

Plaff, Charles A. Chaos, Complexity and the Modern Battlefield in *Military Review* July-August 2000.

Strange, Joseph L. and Iron Richard. "Center of Gravity: What Clausewitz Really Meant." *JointForce Quarterly*, Issue 35